# The Refrigeration Service Engineer

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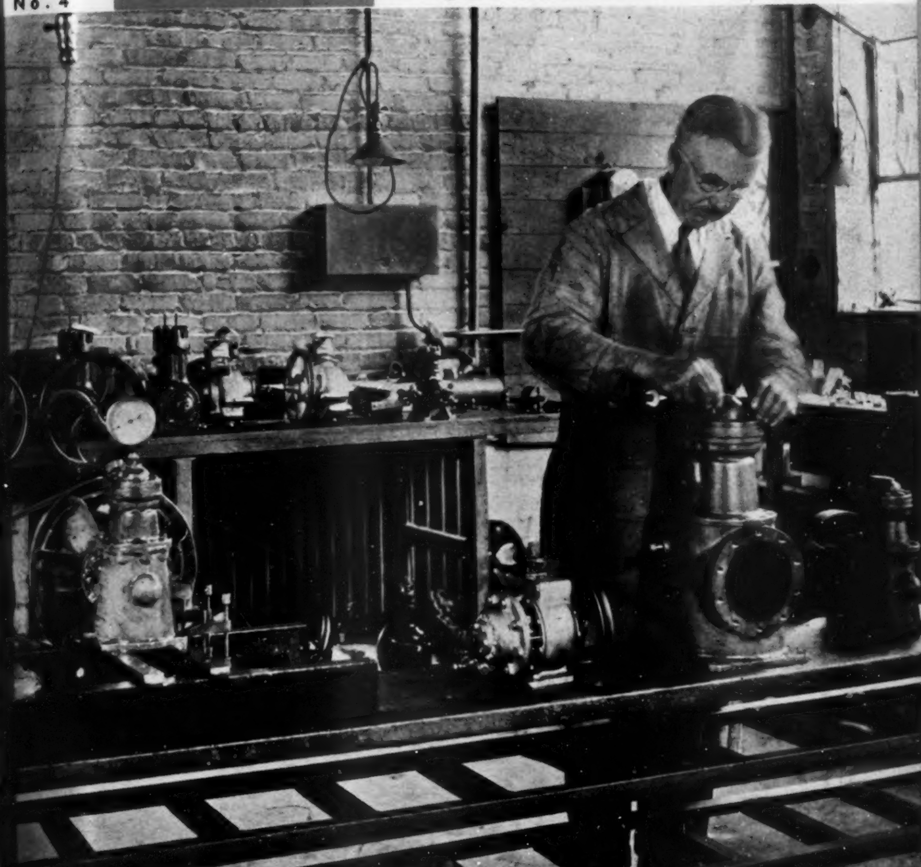

**Mayflower Domestic Compressors—Safety For Service Men—Practical Service Pointers Condenser Chart—The Question Box**

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**ST. LOUIS, MO.**

# *The* Refrigeration Service Engineer

*Devoted to the Servicing of*
Refrigeration Units *and* Oil Burners

VOL. I SEPTEMBER, 1933 NO. 4


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OFFICIAL ORGAN REFRIGERATION SERVICE ENGINEERS' SOCIETY

VOL. 1, No. 4 CHICAGO, SEPTEMBER, 1933 $2.00 per Annum

# Mayflower Domestic Compressors

**This article Describing Mayflower Domestic Compressors, gives Pertinent Information regarding Servicing. Analyzing Improper Operating Conditions and their Remedies. Illustrations of various working parts of the equipment.**

IN order that the service man may be informed in reference to the design, construction, operation and servicing of various types of both household and small commercial refrigeration equipment, it is proposed to publish from time to time detailed descriptions of the old and new compressors and other apparatus.

Recently, requests have been received from readers for information in reference to the Mayflower refrigeration units, manufactured by the Trupar Manufacturing Co., of Dayton, Ohio. Because of lack of space it is impossible to give full particulars in one issue on any one make of refrigerator, but some essential information will be given in this number covering the Mayflower compressors and details of equipment, to be followed in future issues with additional information. We are indebted to Mr. Wm. Hunt, Service Manager of the Trupar Manufacturing Co., for his cooperation in presenting this material to our readers.

Since 1920 Mayflower engineers have designed and built domestic refrigeration equipment. The fundamental design of this compressor has proved itself because of the satisfactory operation which has been received by users who have had these compressors installed in their homes for ten years or more. This type of compressor is known as reciprocating and is in use by many refrigeration manufacturers.

While the basic design has remained unchanged, many improvements have been made to increase the efficiency, quietness, and durability of the compressor. Other changes have been made in the design of the complete compressor assembly in order to adapt it to different types of cabinets in use at various times.

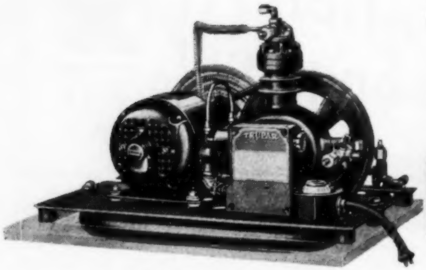
### Obsolete Models

To simplify the description, models earlier than 1927 are not discussed.

In 1927, 1928 and 1929 models used for domestic refrigeration were the No. 100 and No. 200, designed for basement installation. These compressors were shipped separately and were installed by the dealer, who also installed the cooling unit in the cabinet at the same time.

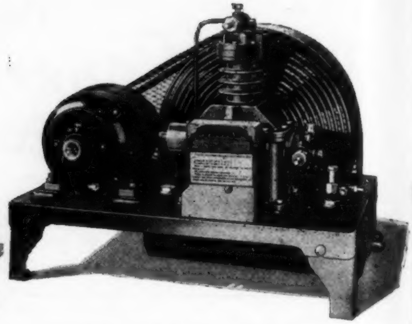
These compressors were on legs, equipped with fan and pulley guard, and operated by pressure control.

These compressors were not equipped with fuses, so to pass the electrical code, it was



**NO. 75. MAYFLOWER AIR COOLED COMPRESSOR**

Capacity—75 lbs. ice melting effect. For self-contained installation.
Compressor—Single cylinder, 1⅜" bore, 1¾" stroke, 400 R.P.M.
Motor—⅙ H.P. Standard equipment, 110 V., 60 Cy., 1 Phase, 25, 30, 50 Cy., 110 V., or 220 V., A.C., or 32, 115 or 230 V., D.C. on order.
Condenser—Finned spiral tubing. Fan on motor shaft.
SO-2 Charge—1½ lbs.
Oil Charge—¾ pt.
Overall Dimensions—22⅝" wide, 14½" deep, 15½" high.
Weight—Crated, 128 pounds.
Control—Pressure switch, low side.
Installation—Self-contained.



**NO. 100. MAYFLOWER AIR COOLED COMPRESSOR**

Capacity—100 lbs. ice melting effect. For remote installation.
Compressor—Single cylinder, 1⅜" bore, 1¾" stroke, 400 R.P.M.
Motor—⅙ H.P. Standard equipment, 110 V., 60 Cy., 1 Phase, 25, 30, 50 Cy., 110 V., or 220 V., A.C., or 32, 115 or 230 V., D.C. on order.
Condenser—Finned spiral tubing. Fan in compressor flywheel.
SO-2 Charge—3 lbs.
Oil Charge—1 pt.
Overall Dimensions—22¾" wide, 14½" deep, 17½" high.
Weight—Crated, 143 pounds.
Control—Pressure switch, low side.

necessary to run a special line to the meter, using a safety switch fuse box in-line to fuse motor and also act as a defrosting switch. On current models, this is not necessary as compressors are equipped with fuse or thermal cut-out and defrosting switch.

In 1930, Models No. 75 and No. 150 were designed for self-contained installation in the then current cabinets. These compressor subassemblies were practically identical with the Models 100 and 200. No legs were used, the compressor resting on rubber feet instead. A U-Type receiver tank and pressure switch were found on these models. The fan guard was abandoned with self-contained models.

In order to accommodate the No. 75 Compressor in a cabinet with a compressor compartment of less height, the low head compressor was developed. The first model of this type was known as the 75-L.

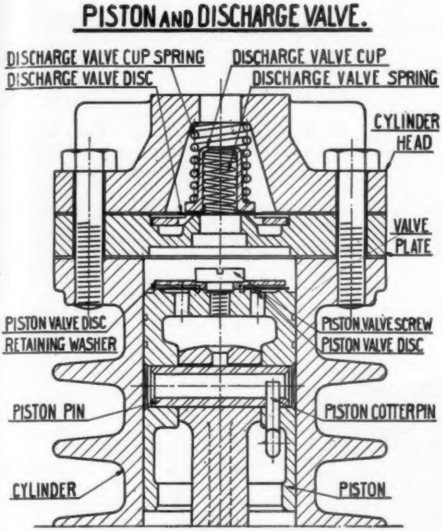
### Valve Construction

The piston valve in Mayflower compressors built previous to the 1930 models used a small piston valve disc (p.c. No. 20028) the clearance of disc was controlled by a flat steel spring. This spring is superseded by a small spacer (p.c. No. D-218) and the spring eliminated. For replacement parts for the old type piston valve, order p.c. No. 20028 and No. D-218.

The next piston valve consisted of a large Swedish steel disc (p.c. No. 20084) held in place by a retainer washer (p.c. No. 20085) which controls the clearance of piston valve disc (.005). This clearance should be carefully checked with the feeler gauge when making replacement of disc.

The piston now in use consists of the same steel disc (p.c. No. 20084) and the new retaining washer (p.c. No. 20085). This new washer is not interchangeable with the old one and in any case where it is used to replace an old one, a new valve plate (p.c. No. 20088) which has enough clearance for the new washer, should be ordered and installed.

The discharge valve disc on all domestic compressors has remained the same (p.c. No. 20031). Previous to the 1930 model compressor a different type spring was used on discharge valve disc. This spring was a flat steel spring, which is replaced by a small compression spring.




The following are the necessary parts to replace old type: spring disc cap, p.c. No. 20033; inner spring p.c. No. 20035; outer spring, p.c. No. 20034; disc, p.c. No. 20031.

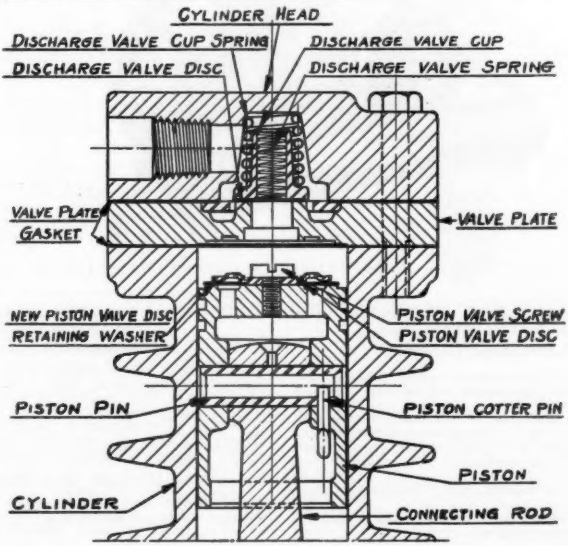
The above parts are used on current models.

In 1931 Models 70 and 140 Compressors were used for self-contained installations. These were almost identical with the models of the previous year, except that a different type sump tank was used, the design of the entire compressor was more compact, and they were built without pressure switch.

Current model domestic compressors for 1932 are the No. 70 and No. 110. The No. 110 compressor is almost identical with the No. 140, except that the No. 110 compressor runs slower.

**TOP—Showing the old style piston and discharge valves used in the Mayflower Domestic Compressor.**

**BOTTOM—Cross Section View of present Mayflower Compressor illustrating new style piston and discharge valves.**



# ANALYSIS OF IMPROPER OPERATION OF MAYFLOWER REFRIGERATORS

## 1—If Compressor Runs Continually and No Refrigeration

(1) Low on gas, due to leak in system. See "Testing for Leaks" (10). See "How to Add Sulphur Dioxide" (13).
(2) Float valve leaking due to dirt on seat or defective valve seat, indicated by back frost on suction line. See "Float Valve Leaks" (11).
(3) Piston valve not closing due to warped disc or some foreign element under piston valve disc. See "Piston Valve does not seat" (14).
1, 2, and 3 apply to obsolete and current models.
(4) Stopped up liquid line screen at cooling unit, sometimes indicated by frost on liquid line, sometimes indicated by a partially frosted liquid line valve on cooling unit. See "How to Evacuate Liquid Line" (22).
Stopped-up Liquid Line Screen.
On obsolete models using Low Pressure Control. The compressor would not run and cooling unit would be warm. (See "How to Evacuate Liquid Line" (22).

Fulcrum screw connecting bellcrank lever and connecting stud out of place (Fig. 2).
Stuck contacts on low pressure switch. Clean contact.
Vacuum set too low on switch. See "Low Pressure Control" (7).

## 3—If Compressor Runs Too Long Yet Cabinet Temperature and Ice Freezing Satisfactory

(1) Slightly short of gas. See "How to Add Sulphur Dioxide" (13).
(2) Discharge valve leaking slightly, due to dirt or defective seat. See "Leaky Discharge Valve" (23).
(3) High head pressure, due to air in system, indicated by very hot compressor and excess vibration. See "Air System" (25).
(1), (2), (3) apply to obsolete and current models.

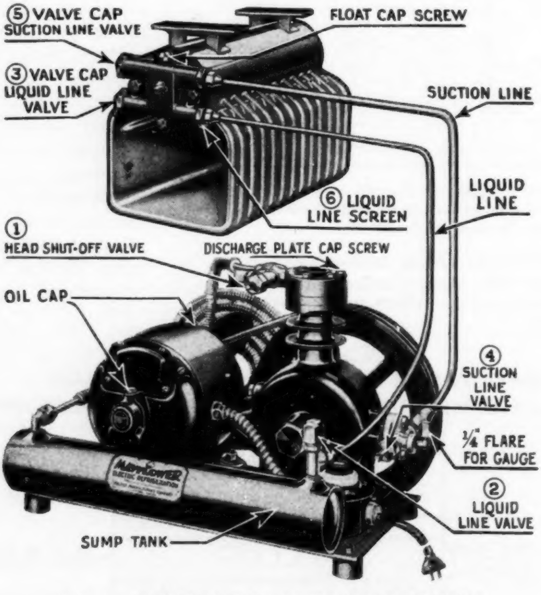



FIG. 1. ILLUSTRATION OF COMPLETE SYSTEM

## 2—If Compressor Runs Continually with Excessively Low Temperatures Thermostatic Control

(1) Defective temperature control due to contacts stuck closed on interior of control. Do not attempt repair but replace.
(2) The freezing point of the liquid in the control may be too low, causing too much refrigeration in the cabinet before bellows expands enough to break contact in control. Not repairable, so *replace.*
Shorted wires in control. See "Temperature Control" (16 or 17).
Continually running and excessively low temperature on low pressure control.

## 4—Running Time of Compressor Too Long with Poor Ice Freezing

**Thermostatic Control**

(1) Excess oil in cooling unit. Due to oil not returning from cooling unit to crankcase of compressor. See "Oil condition in Cooling Unit" (27).
Oil Condition in Cooling Unit.
On low pressure control would make compressor short cycle three or four times, then run a regular cycle. See "Oil Condition in Cooling Unit" (27).

## 5—If Motor Does Not Run

(1) Blown fuse—due to motor overload or low voltage in line. This trouble can be caused by lack of oil in motor bearings. Remove belt, turn motor

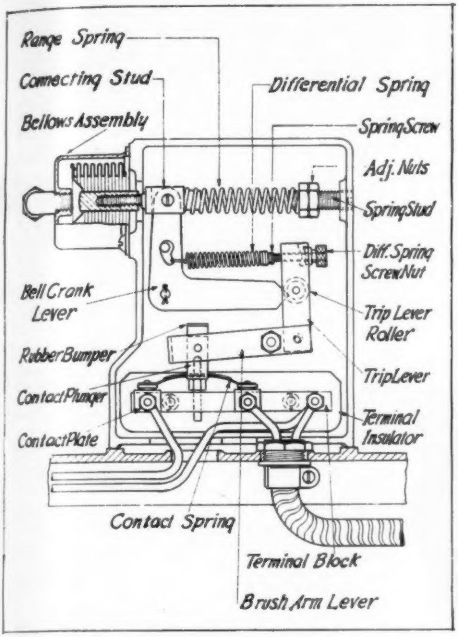



FIG. 2. LOW PRESSURE SWITCH

by hand, if it does not turn freely, oil motor. Note: Use medium automobile lubricating oil.

(2) High head pressure. See "Air in System" (25).

(3) Lack of oil in compressor, indicated by tight compressor and squeak in cylinder wall. Test by removing belt and turning fly wheel by hand and if it does not turn freely, see "How to Add Oil" (26).

(4) Belt too tight. Test: Lay ruler or straight edge from top of motor pulley to top of compressor pulley. Belt should depress about ¾ inch at point midway between pulleys.

(5) Stuck compressor. Due to moisture in system. See "Moisture in System" (28). See "How to Remove Compressor Head" (15).

## 6—If Crank Shaft Seal Leaks

See "Crank Shaft Seal Leaks" (24).

## 7—Low Pressure Control

All Mayflower Refrigerators built, including the 1929 Models, were controlled by Low Pressure Control as shown in cutaway (Fig. 2).

The Low Pressure switch is designed to operate by vacuum and pressure on the low side of system. The switch is equipped with a copper bellows assembled, which is connected by a piece of ¼" tube to crankcase of compressor. As the pressure increases in crankcase, the bellows contracts, pushing the *Connecting Stud and Bellcrank Lever* out, operating trip lever down, making electrical contact and starting compressor. As the pressure decreases in crankcase, the bellows expands operating the connecting stud and bellcrank lever in reversing operation and stopping compressor. This type of switch was set at the factory to cut-in approximately at a 5-pound pressure and cut-out at approximately 7 inches vacuum.

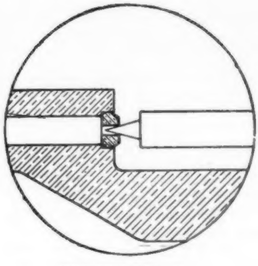


FIGURE NO. 5

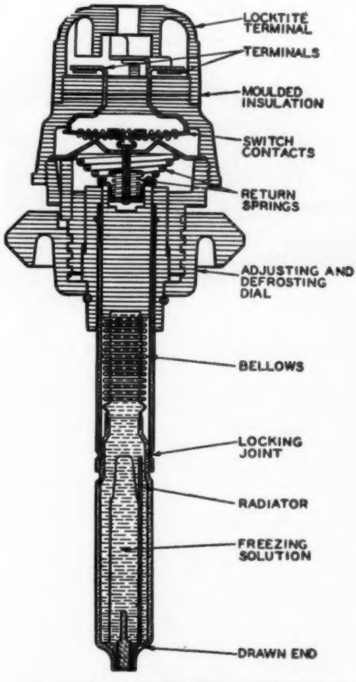



FIG. 6. DIAGRAM OF MUSHROOM CONTROL UNIT, TYPE "R"

In making a low pressure switch setting, it is necessary to install a compound gauge on the compressor. See "How to Install Gauge" (8) also (Fig. 3).

Figure 2 is a cutaway of low pressure switch. There are two adjustments on the switch. One being, *Range Spring Adjustment*, and the other, *Differential Spring Adjustment*. After compound gauge is properly installed, turn suction line valve (No. 4, Fig. 1) to right as far as possible. This shuts off suction line to cooling unit, allowing compressor to pull vacuum in crankcase and on gauge.

Check gauge at what vacuum the compressor stops at. If box is not cold enough and compressor stops at 6 inches of vacuum, turn adjusting nuts (Fig. 2) to left about two turns. This will increase vacuum and set job colder, or if box is too cold, turn adjusting nuts to right. This will stop compressor at less vacuum making job warmer. A switch setting at 7 inches vacuum to cut-out, and 5 pounds pressure to cut-in will give the proper temperature if machine is operating correctly.

In Figure 2, Differential Spring Adjustment. This adjustment changes both cut-in and cut-out point. Turn to right increases cut-in point, also increased cut-out, or vice versa.

## 8—How to Attach Gauges

Before connecting gauges study cross section of valves (See Fig. 4). Note valve stem has a double seat. The purpose of the double seat is to enable one to connect gauges without permitting gas to escape during the operation.

**FIG. 3. SHOWING GAUGES ATTACHED**

The rear seat of valve also prevents gas from escaping through packing because packing is not dependable over a long period of time.

Remove pipe plugs or seal caps in condenser and compressor shut-off valves (See Fig. 1) and insert ¼" half union coupling and connect gauges by means of short piece of ¼" tubing. Pressure gauge should be attached to condenser shut-off valve on top of cylinder. Compound gauge should be connected to compressor shut-off valve on side of compressor. *Never put compound gauge on condenser side of system, as condenser pressure exceeds its gauge and would instantly ruin the gauge.*

See Fig. 3 showing gauges installed.

After gauges have been properly placed, turn valve stem slightly to the right as if to close it, but only enough to cause the hand on gauge to vibrate slightly. If valve is turned too far, the excessive vibration of hand will render an accurate reading impossible. Before removing gauges, be sure to close valves against their back seat, otherwise gas will escape.

After gauges have been removed, replace pipe plug or seal caps, applying a little white lead to their threads and screwing up moderately tight.

## 9—The Shut-off Valves

On Mayflower Refrigerators there are five hand-controlled shut-off valves, used for the purpose of repairing or disconnecting compressor and cooling unit without the loss of sulphur dioxide. See Fig. 1.

No. 1 is the condenser shut-off or head valve, located on top of the compressor. It connects the compressor to the condenser. No. 4 is the compressor suction line valve, located on the crankcase of the compressor. This valve connects compressor to suction line, which in turn connects with cooling unit.

These valves are *two-way* valves. See Fig. 4. When the valve stem is fully backed out, there is a one-way passage for sulphur dioxide through the system. When the valve stem is in, passage is open for gauge connection and system line is shut off. To make gauge connection, shut off from pressure in system by turning valve stem to left as far as possible. This permits the installing of gauges. If valve stem is turned half way between open and shut, passage of gas is permitted through system and on gauge as well.

The three remaining valves are known as one-way shut-off valves (See Fig. 1).

Compressor liquid line shut-off valve (No. 2).
Cooling unit liquid line shut-off valve (No. 3).
Cooling unit suction line shut-off valve (No. 5).

The stems of these valves are sealed under safety caps which must be removed to open or close valve. Turn valve stem to right to close. In opening valves open to left several turns. IMPORTANT: Do not force against back stop on these valves as packing will be disturbed.

Always replace safety cap after opening or closing valves.

## 10—Testing for Gas Leak

Use 28% ammonia for test. Note, weak solutions of ammonia will not indicate very small leaks, so make certain that you get a concentrated solution. Your druggist can supply you with such aqua ammonia.

Use a small brush or stick with a piece of rag or cotton on the end of it to hold the ammonia. Dip end in bottle of ammonia and check connections by passing the ammonia saturated stick near the threads.

If a leak is present, a white smoke will rise from the escaping gas. This test is very accurate, indicating the minutest gas leak.

Do not touch copper or brass with ammonia swab as ammonia has a corrosive effect on these metals.

The following gives the necessary connections and compressor parts to test for leaks.

(1) Test the interior of the cabinet for gas. If there is a trace of gas in the cabinet, remove the porcelain panel in front of cooling unit. Test the flare nut on suction valve. See Fig. 1. Repeat

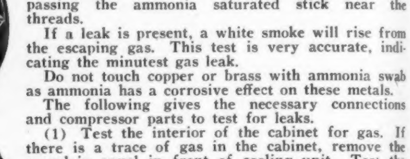



**FIGURE NO. 4**

the same operation on liquid line valve nut. This will no doubt reveal the leaks. Tighten leaky connection which may have loosened in shipment.

(2) Check compressor for leaks as follows. Suction line valve flare connection (Valve No. 4, Fig. 1), liquid line valve flare connection (Valve No. 2, Fig. 1).

When cooling unit is cold, disconnect electric current for about 30 minutes, allowing pressure to build up in crankcase. Then test crankshaft seal. See Fig. 8.

In case of leak at shaft seal. See Section No. 24 for repairs.

## 11—Float Valve Leaks

If for some reason the float valve is prevented from shutting off liquid supply at proper level, then the level will rise to the point where liquid sulphur dioxide will be drawn through the suction tube to the crankcase. This causes refrigeration and a formation of frost to take place at these points.

Sometimes there is not sufficient liquid reserve in the receiver tank to permit the liquid level in cooling unit to rise to a point where back frost will occur, and in this case only compressed sulphur dioxide vapor will be forced through float valve, causing a gurgling sound in cooling unit like air being blown under water. If this condition exists, compressor will be running continually, also a very low reading will be noticed if pressure gauge is attached to condenser shut-off valve.

To remedy this condition first charge additional refrigerant into system. (See "How to Add Sulphur Dioxide," Section 13). If during this process frost should appear on suction tube, it is a sure sign that the float valve is not seating properly. This condition while rare, occurs shortly after a machine has been installed and is largely caused by careless handling of cooling unit in transportation. The trouble can usually be rectified by closing compressor liquid line valve (Fig. 1) to right as far as possible. Run compressor for 25 minutes, then open compressor liquid line valve. The general effect of this procedure is to wash out any foreign matter that may have become imbedded in float valve seat. If, after all the above methods have been tried, the system continues to back frost, it will be necessary to replace cooling unit and return defective one to distributor for repair. See "Cooling Unit."

When an experienced service man is available, it is practical to change float valves on all porcelain cooling units, however, the operation should not be attempted unless the service man has practical knowledge; otherwise serious accidents may occur.

The following steps are necessary in changing float valve: Install compound gauge on compressor (see Sec. 8) then close liquid line valve (on compressor), open food compartment door and start compressor. It will require approximately one and a half hours of continuous running to pump all of the SO-2 out of cooling unit. When the SO-2 is completely out of cooling unit, the frost will completely melt from unit, and compound gauge will show approximately 25 inches of vacuum. When this condition is reached, stop compressor. If gauge goes back to "0" pounds pressure, it will be necessary to run compressor to remove the remainder of SO-2, but if gauge stands at 25 inches of vacuum it is a sure indication that all the SO-2 has been removed from unit.

It is then necessary to relieve the vacuum in cooling unit. If unit was disassembled with 25 inches of vacuum there would be a considerable amount of air drawing in, which would cause trouble. Relieve vacuum by opening liquid line valve on compressor very slightly and only for a fraction of a second. Repeat the operation until gauge shows "0" pounds pressure, then close liquid and suction line on cooling unit, and suction line valve on compressor.

Remove both liquid and suction line from cooling unit and float valve is ready to be removed from coil. (Before removing old float valve, have new float valve ready with new gasket properly placed on new float). Then remove the four header screws holding float valve to porcelain unit. Use sharp screw driver to pry float head loose from coil. *Care should be taken not to crack porcelain.*

When new float is completely assembled to unit, connect liquid and suction lines to coil and open both valves on cooling unit. Then open liquid valve on compressor, letting a small amount of gas to cooling unit and again close liquid valve. Test for SO-2 leak (see Sec. 10). If no leak occurs, purge air from coil and lines by cracking suction line flare nut on compressor until a strong odor of sulphur is noticed, then tighten flare nut. Open liquid and suction line valve on compressor and start job.

## 12—How to Disconnect Cooling Units or Compressor

Close Liquid line valve (No. 2, Fig. 1) to right as far as possible. Run compressor until liquid line at compressor becomes cold and then warms up to room temperature, this will indicate the sulphur dioxide liquid has left liquid line. This will require about 6 or 8 minutes. Then close liquid line valve (No. 3, Fig. 1) at cooling unit. To do this remove porcelain front and temperature control, then remove valve caps on left of float valve header (Fig. 1). Immediately close suction line valve (No. 5, Fig. 1). This will evacuate suction line. Close suction line valve (No. 2, Fig. 1) to right as far as possible at compressor. Stop compressor. Lines at cooling unit or compressor may be disconnected without gas odor.

When connecting compressor and cooling unit, it is necessary to purge the air from the lines that have been exposed to the air. This is done by making all connections tight on cooling unit and compressor. Then open both shut-off valves on cooling unit, letting the gas pressure into lines. Then crack liquid line flare nut on compressor, allowing the gas pressure to purge air out of line at compressor. When a strong odor of SO-2 is noticed, tighten flare nut. Use same procedure on suction line, and unit is ready for operation.

Caution: When re-assembling thermostatic control unit to cooling unit, be sure white mark above temperature dial is in center of porcelain front opening. If it is off center it will bring temperature control dial out of adjustment.

## 13—How to Add Sulphur Dioxide

The first indication of a shortage of gas is shown by the compressor running continuously. In determining a shortage of gas listen for a hissing noise at the cooling unit, resembling the leaking of air through water. Before adding sulphur dioxide, check compressor and cooling unit for leaks. (See Section 10).

First see if suction line valve (No. 4, Fig. 1) is turned to left as far as possible. Remove cap on compressor shut-off valve elbow. Attach one end of a short piece of ¼" tubing with union nut on each end. Attach service cylinder to other end and open valve on same, keeping cylinder in an upright position.

Now close compressor shut-off valve (No. 4, Fig. 1) by turning to right as far as possible. Start compressor and place cylinder in a pail of warm water, which adds heat and raises the pressure.

After running compressor for ten minutes, open compressor shut-off valve (No. 4, Fig. 1) to left as far as possible and allow compressor to complete a full operating cycle. If sufficient gas has been charged in compressor, hissing in cooling unit will cease. If not, repeat above operation.

After charging compressor twice and hissing still continues, check crankcase of compressor and suction line to see if they are getting cold or frosting, if so, it is a sure indication of a leaky float. (See Float Valve Leak 11).

## 14—Piston Valve Does Not Seat

The compressor will not pull a vacuum when the piston valve is holding open. The needle on compound gauge will fluctuate back and forth slightly. (See Fig. 3).

Remove compressor head. (See Section 15). Condition may be caused by a particle of foreign matter being lodged between piston head and valve disc in which case remove foreign matter.

Another reason for valve not seating properly is because it may adhere to piston valve disc retaining washer.

In the event that piston valve is of the old type (See Section "Valve Construction").

## 15—How to Remove Compressor Head, Crankshaft Seal or Compressor Sub-assembly

Install compound gauge on suction line valve (No. 4, Fig. 1). When putting gauge on this connection be sure that valve is turned to left as far as possible. Run compressor several seconds, then close condenser shut-off valve (No. 1, Fig. 1). After this operation the compressor sub-assembly is ready to be dismounted.

## 16—Types "R" or "RD" Temperature Control

Type "R" or "RD" thermostatic control units were used on Mayflower refrigerators in 1931. They should not be serviced except by the factory. There is no adjustment or repair on the interior of this control with the exception of a detachable cap that connects on the top of the control unit. There are three troubles that might develop in this cap, and be repaired on the job.

exposing the two binding posts of the motor leads. Place a piece of metal across these two terminals and if this starts compressor it is a sure indication that the control is defective and should be replaced.

## 17—Type "D" Temperature Control

The Type "D" control unit operates on the thermostatic principle, being actuated by the temperature of the cooling unit to which the tube containing the thermally affected substance is attached. The tube

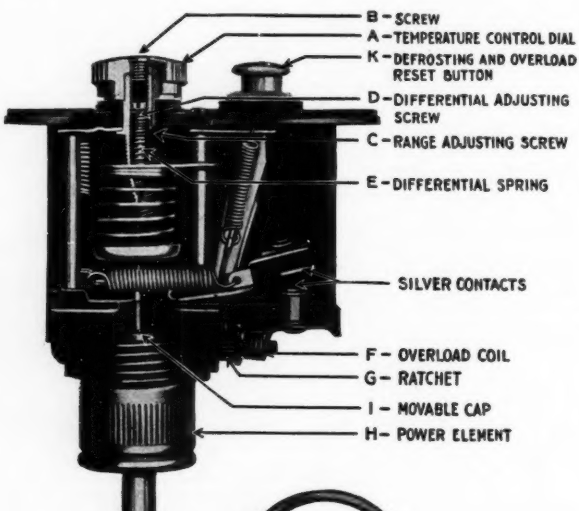



FIG. 7. DIAGRAM OF BUTTON CONTROL UNIT, TYPE "D"

1. If motor lead wires from compressor that fasten in this detachable cap become shorted across, it would cause the compressor to run continuously. To remedy this condition, remove detachable cap from unit by turning to left and lifting off of unit. In the bottom of this cap there are two screws; remove these two screws, thus exposing the binding post for the two wires. If the wires are shorted, separate wires well and fasten tight to binding posts.

2. If the compressor runs continuously and there is excess refrigeration in the cabinet and removing detachable cap from top of unit stops compressor, this will indicate a defective control unit, which should be replaced and old one returned to factory.

3. If compressor fails to run, fuse being all right and in working order, remove detachable cap from top of control unit as mentioned above, also remove the two screws from the bottom of the cap, this

consists of an expansion bellows on the one end and a bulb on the other, and is filled with liquified methyl chloride.

This liquid is in thermal contact with the cooling unit. When the temperature of the methyl chloride is lowered, contraction takes place. This decrease in volume allows the bellows to contract or move backward. This action coupled with the tension of the heavy spring in the control opens the switch in the body of the control unit. The opening of this switch stops the compressor motor.

During the following idle period the methyl chloride in the tube expands. This forces the bellows to move forward and compress a spring, closing the switch. As the switch closes, an electric contact is made and the motor on the compressor begins to operate. This expanding action occurs as the interior of the cabinet begins to warm up and hence the necessity for again starting the compressor.

The control knob protruding through the front affords a temperature control because it increases or decreases the tension of the spring which governs the point at which the switch operates. The pressure exerted by the bellows is directly proportional to the temperature of the cooling unit, that is, the higher the temperature of the cooling unit, the higher the pressure in the bellows; so that in order to lower the temperature in the cabinet, the tension on the spring must be decreased to lessen the part the spring plays in kicking off the switch. This would mean that the compressor must run considerably longer to bring the temperature of the cooling unit sufficiently low to force the bellows to contract enough to allow the spring (whose tension has been lessened by the manipulation of the control knob) to operate the switch. Increasing the tension of the spring in the control, of course, produces an opposite effect.

## 18—To Change Temperature Range

*Temperature Control Dial "A"*—The thermostat will operate at its highest temperature when the temperature control dial is set at point No. 1. The thermostat will operate at a lower temperature when the dial is rotated toward point No. 8.

1. *To Lower Range*—If it is desired to obtain a lower operating range than is obtained by moving the dial "A" to point No. 8, first make sure that the arrow points to No. 8, then remove screw ",," take off dial "A" and set it on again with the arrow at say 4 or 5, and replace screw "B." This relocation of the temperature control dial on the range adjusting screw "C" permits a lowering of operating temperature at the bulb of the thermostat of approximately 5° F. when the dial is again turned to point No. 8. The box temperature will be lowered somewhat less than that amount.

The total adjustment between points No. 1 and No. 8 is about 10° F. on a household refrigerator, or about 6° on a water cooler installation. With these facts in mind it is easy to lower the range the required amount by relocating the dial either forward or backward any desired proportion of this range.

2. *To Raise Range*—Move the dial to point No. 1 and then remove screw "B"; take off dial "A" and put it on again with the pointer set at some higher value. For instance if 5° F. change is desired at the thermostat bulb, set pointer between No. 4 and No. 5. If 10° F. change is desired set pointer at No. 8. Any intermediate value may easily be obtained.

3. *Caution*—If temperature control dial "A" is removed for any reason other than temperature adjustment, one should observe the position of the pointer so that replacement may be made in exactly the same position, otherwise the temperature range may be changed.

## 19—Differential Adjustment

Differential adjustment is obtained by means of screw "D" which may be turned with a narrow blade screw driver to increase or decrease the tension on the differential spring "E."

1. *To Increase Differential*—Take out screw "B" and turn screw "D" clockwise. This will raise the "cut in" value but will not alter the "cut out" setting. Each complete turn of the screw "D" to right will raise or lower the "cut in" point about 4° F.

2. *To Decrease Differential*—Proceed as above except turn the screw "D" counter clockwise. It must be observed, however, that there is a definite minimum differential below which it is impossible to make further adjustment. When the tension is entirely removed from the differential spring no further reduction in differential can be made.

## 20—Overload Protection

In case the motor becomes stalled or overloaded the overload coil "F" will release a ratchet "G" and allow the switch to open. Button "K" will automatically be pushed out and show a red band on inner part of button "K." To restart the motor push button "K," thus closing the switch and resetting the overload.

Overload coil "F" is marked with the current value at which the switch will open on a prolonged overload.

The overload device is designed to carry the rated current and to open the circuit in 85 to 105 seconds on 180% of this load. Overload coils may be obtained in the following sizes:

| | | | |
|---|---|---|---|
| 1.3 amp. | Part No. 7833 | 4.5 amp. | Part No. 7615 |
| 1.75 amp. | Part No. 7916 | 5. amp. | Part No. 7582 |
| 1.9 amp. | Part No. 7914 | 5.5 amp. | Part No. 7650 |
| 2.1 amp. | Part No. 7915 | 6. amp. | Part No. 7583 |
| 2.3 amp. | Part No. 7913 | 6.7 amp. | Part No. 7651 |
| 2.6 amp. | Part No. 7910 | 7. amp. | Part No. 7888 |
| 2.8 amp. | Part No. 7649 | 8. amp. | Part No. 7652 |
| 2.9 amp. | Part No. 7581 | 8.1 amp. | Part No. 7908 |
| 3.2 amp. | Part No. 7912 | 9. amp. | Part No. 7938 |
| 3.5 amp. | Part No. 7648 | 10. amp. | Part No. 7832 |
| 3.8 amp. | Part No. 7911 | 11. amp. | Part No. 7948 |
| 4. amp. | Part No. 7510 | 12. amp. | Part No. 7964 |
| 4.2 amp. | Part No. 7909 | | |

The overload coil may be replaced by one of a different rating by removing two screws. When replacing on overload coil it is necessary that the new coil be properly centered on the overload ratchet pin.

## 21—Power Element

The power element "H" contains a bellows with capillary tube and bulb attached. The bulb should be clamped firmly in contact with the cooling unit.

Power element "H" contains a gas vapor charge, and when the bulb is warm the pressure of the gas vapor will always be sufficient to close the switch.

Should the power element lose its gas charge the switch would remain open.

To test the power element for loss of charge, remove the entire power element, and with the bulb warm press the movable cap "I." If the gas has escaped a slight pressure will depress the cap. If the gas has not escaped a considerable pressure will resist any depression of the cap.

When a power element loses its charge a replacement of the power element "H" is necessary.

It is important that the power element be screwed firmly in place, by hand; not with a wrench.

## 22—How to Evacuate Liquid Line

The operation of a compressor with stopped up liquid screen will be continual running, water will not freeze and the only part of the cooling unit that will frost will be the liquid valve (No. 3, Fig. 1) at cooling unit.

To remove this screen (No. 6, Fig. 1) close liquid line valve at compressor (No. 2, Fig. 1). This will take at least one-half hour to relieve liquid in line. To help this operation take block of wood and tap on liquid valve (No. 3, Fig. 1). This will loosen dirt in screen and let liquid by. To test, loosen very slightly the liquid line flare not at compressor. If no gas leaks out, liquid has expanded from line. Close liquid valve (No. 3, Fig. 1) and remove screen (No. 6, Fig. 1). Either clean or replace with new one.

## 23—Leaky Discharge Valve

Leaky discharge valve can be determined by installing compound gauge. (See Fig. 3, also read section 8). After gauge is installed, close suction line valve (No. 4, Fig. 1) to right as far as possible and start compressor. If compressor will not pull a vacuum, it is an indication of a defective discharge valve. A compressor with a good discharge valve should pull in excess of a 20" vacuum, which should not leak back to more than "0" lb. pressure in one-half hour. If it leaks back more than this it should be considered defective and should be repaired. To remove compressor head see Section 15, also Fig. 1. After head is removed, examine valve disc and valve seat. Foreign particles may be on the seat or carbon on valve disc. Replace valve disc (Part No. 20031) and reseat valve seat. To reseat valve seat, use a

small flat Arkansas stone. Be careful to polish a good flat seat. This Arkansas stone is white and does not cut excessively. It merely polishes the metal to a smooth surface.

If the compressor is of the old type using the flat steel spring; refer to Section "Valve Construction."

## 24—Leaky Crankshaft Seal

In some instances a crankshaft seal will develop a leak, which can be detected by the ammonia smoke test. When such a leak is found, it is necessary to reseat the seal around the crankshaft or replace with new seal. To remove seal proceed as follows:

Have crankcase "0" to "1" lb. pressure. Never have it under "0" or air and moisture will rush in when opened.

Remove belt, unscrew hexagon cap screw in center of compressor flywheel. Remove flywheel by screwing ⅝ S.A.E. cap screw into threaded opening in end of hub, keep turning forcibly to right until flywheel slides off shaft.

Remove crankshaft seal nut and crankshaft seal. If crankshaft seal ring is worn, replace with new seal. In case a new seal is not at hand, the old one may be repaired as follows:

Place a small quantity of B-2 grinding compound on face of seal ring, and polish shoulder of shaft by oscillating motion of seal against shoulder adding grinding compound occasionally. Continue until shoulder of shaft shows a glossy surface around entire circumference.

After this operation, be sure to clean all the grinding compound from the seal and shaft by means of a brush and gasoline, wiping thoroughly with dry cloth, it should show a perfectly even polished surface. It should not show dark spots.

As the crankshaft seal ring is of softer metal, the grinding compound becomes imbedded in it, causing its surface to become rough. Polish with a soft Arkansas white oil stone or a Pike Handihone, using a circular motion, with gasoline as a lubricant. Surface of stone must be perfectly flat—not concave or convex.

This type crankshaft Seal has been Standard on all Mayflower Compressors.

The Seal used on Compressors Nos. 100, 140, 150, and 200 (pc. No. 10001).

The Seal used on the remaining models (pc. No. 10003).

## 25—Air in System

Air may enter refrigeration system through the suction or low side. This may be on account of defective crankshaft seal, flare nut or tubing. Air, being a non-condensable gas, will cause a high head pressure in the condenser coil.

To test for air in system, install pressure gauge on head shut-off valve, No. 1, Fig. 1, by removing cap and installing gauge on this connection. For a normal head pressure, gauge reading in pounds should be from 3 to 10 numbers less than the degrees room temperature Fahrenheit, when compressor is operating.

Example: If room temperature is 80 degrees Fahrenheit, head pressure should be from 70 to 77 lbs. pressure.

With a room temperature of 80 degrees and head pressure of 100 lbs. compressor should be purged of air. Before attempting to remove air from system, shut compressor off for at least one-half hour, to let pressure build up on low pressure side of system, then test entire system for gas leak, to find where air entered system. Repair defect and purge air as follows:

Detach pressure gauge by turning shut-off valve to left as far as possible. Be sure compressor head is cool, then turn shut-off valve slightly to the right, allowing air to escape. Air being lighter than sulphur dioxide vapor, it rises to the top. If a considerable amount of air is to be discharged, attach ¼" tubing to gauge connection and extend outdoors or in a pail of lye water. One pound of lye will neutralize one pound of sulphur dioxide. Use same operation to discharge sulphur dioxide.

## 26—How to Add Oil

An indication of shortage of oil is shown by a very stiff compressor and in some instances a squeak in cylinder. A great shortage of oil will stick the compressor. To test, remove belt, turn flywheel by hand. If it turns hard, it's a good indication compressor is low on oil. Before adding oil be sure the oil is special refrigeration oil furnished by factory. Other oils have moisture in them and will cause compressor to stick.

To add oil, connect ¼" piece of tubing to gauge connection on suction valve. Extend open end in clean vessel and add about ¼ pt. of oil. Then close suction line at cooling unit, No. 5, Fig. 1. Run compressor for two minutes and stop. Then give suction valve No. 4, Fig. 1, quarter turn to right. This will draw oil into compressor. Valve should be shut off before oil level reaches end of tubing. This will avoid air being drawn in compressor.

It is advisable to pour a little more oil in container than is actually needed.

## 27—Oil Condition in Cooling Unit

Oil conditions in cooling unit is determined by a long running cycle of compressor and ice cubes freezing very slowly and unevenly, half of pan will freeze hard, the other half only part frozen. This is an indication of too much oil in unit. When this condition exists, check to be sure cooling unit is level. If unit is leaning towards back of cabinet, there will be a tendency to accumulate too much oil in cooling unit, thus retarding the boiling of liquid. Level cooling unit.

If cooling unit is level and there is still an excess of oil, add about ¼ lb. of sulphur dioxide to compressor. See how to add sulphur dioxide, Section 13. Keep compressor running and lean cabinet frontwards 6 or 8 inches and hold in this position about 3 or 4 minutes. This will drain oil from the cooling unit and correct the trouble.

## 28—Moisture in System

If moisture ($H_2O$) enters system, it comes in contact with sulphur dioxide ($SO_2$), forming sulphurous acid ($H_2SO_3$). This acid has a corrosive effect on the highly polished cylinder walls, frequently causing the piston to stick. In mild cases, it is possible to free compressor by a rocking motion of the flywheel. If successful in freeing compressor, add about one-quarter pint of oil in crankcase. See "How to Add Oil", Sec. 26.

If above method does not correct trouble, it will be necessary to remove compressor, cooling unit and tubing. See "How to Disconnect Cooling Unit or Compressor", Section 12. Return to factory. The complete system must be baked out to remove moisture.

✻ ✻ ✻

**Walter Rene**
**Missouri**

**"Enclosed please find $2.00 in payment of subscription to THE REFRIGERATION SERVICE ENGINEER. I do not want to miss a single issue of your valuable magazine. I have been recommending the book among my service friends, who seem to be pleased with it. I believe you will hear from them soon. Wish you plenty of luck."**

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**George A. Tiedt**
**Ohio**

**"I sure do not want to miss an issue of THE REFRIGERATION SERVICE ENGINEER, as it contains very valuable information. Please find enclosed money order covering subscription for a year, and also a binder for same."**

# Safety for Service Men

**In this article the Hazards in Dealing with Refrigerating Gases and the Importance of Proper Self-Protection are Outlined. Characteristics of Different Gases Encountered are given.**

*By* **F. R. DAVIS**
**President of Davis Emergency Equipment Co.**

IT may be safely stated, without fear of possible contradiction, that the purer the air which man breathes, the better will be his health, other conditions being the same.

Therefore, it is desirable to take out of the air, which a man is to breathe, other ingredients than those which nature put there.

Such other ingredients are to be found in many processes in industry and should have a very definite recognition as a hazard to health.

The recognition of the hazards of such other ingredients by both the employer and the employee will lead to the furnishing of proper protection by the employer and the proper use of such protection by the employee.

Such team work will lead to the neutralizing of the hazards of these other ingredients, in the air. The result will be a healthier and so a more efficient employee. So employer as well as employee, will be benefited.

There is no more reason why such health hazards should not be recognized and discussed in the same open way as the hazard to the eyes from an unprotected grinding wheel is recognized, discussed and guarded against.

There was a time, of course, when such a hazard as the unprotected grinding wheel was not mentioned but that was before the days of "Safety."

So by taking advantage of what has been done in making work safe by proper mechanical protection, the proper protection against the health hazards of breathing other than pure air should be examined.

There is no more reason to fear such

**DAVIS GAS MASK**

health hazards when proper protection is furnished and used than there is to fear the physical hazard of certain lines of work which today are properly guarded and so safe.

A definite health hazard of present day living is the servicing of mechanical refrigerators which are coming into such general use.

The health hazard is because of the effect upon the man of breathing air with which is mixed one of the following gases in common use as refrigerants:

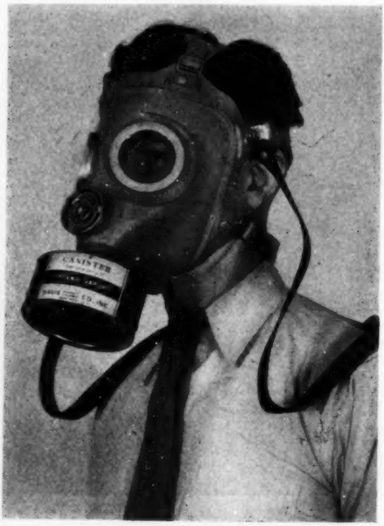
Ammonia — Methyl Formate
Sulphur Dioxide — Methyl Chloride
Dichloromethane (Carrene)
Dichlorodifluoromethane

The recognition of the health hazard of these gases should be as natural as the rec-

ognition of the health hazard of constipation —the one is probably no more important than the other.

There need be no fear for serious results from constipation because ways and means are available to prevent this health hazard.

Neither need there be any fear of serious results from gas-air mixtures for equally sure ways and means are available to protect against them.



DAVIS MASK AND CANISTER

In the case of constipation, it is the elimination of "poisons" collecting in the human system.

In the case of gas-air mixtures, it is a matter of preventing "poisons" entering the system.

It would seem logical, therefore, to set forth, as a definite principle that: (1) the employer will furnish suitable gas protective equipment in the form of gas masks, and (2) that the employee will wear the gas mask *whenever there is a leak* no matter how slight.

The gases to be encountered in refrigeration may be roughly divided into two classes —Irritants and Anesthetics.

"Long continued derangement of health may arise in two distinct ways from exposure to irritant gas: (1) As a chronic inflammation following a single severe exposure to the gas, and (2) as a chronic inflammation caused and maintained by continued exposure to low concentrations of the irritant."

The second cause is the one which should be most carefully considered for when there is a "severe exposure" the gas is so concentrated that a man would not work without a gas mask.

But so often when there are "low concentrations" a man will neglect to put on his gas mask on the theory that he "can eat that stuff."

Such an attitude can only be the result of: (1) ignorance of the consequences of these repeated exposures to "low concentrations," or (2) stupidity in ignoring the consequences.

On the theory of the interest of each man in keeping himself in the best possible health the following information is given as to the effects of the irritant gases encountered in mechanical refrigeration;

### Ammonia

Irritation occurs in the upper respiratory tract. This irritation causes an increase in the rate of breathing and in heart action.

The irritation of the respiratory tract lessens or even removes nature's normal barrier to the invasion of germs. Infection from the germs usually present in the respiratory tract is a common sequel to the repeated exposure to even low concentrations of an irritant gas. Thus while the results are indirect they may be extremely serious.

### Sulphur Dioxide

Acute poisoning is rare because in dangerous concentrations the gas is so irritating to the eyes and throat that it practically cannot be breathed.

The hazard from this gas, as the hazard from all irritants, is its irritating effect on the respiratory tract.

When sulphur dioxide comes in contact with the moist surface of the throat it is converted into sulphuric acid which irritates the surface tissue—resulting in lessening nature's protection to the invasion of germs.

"Sulphur dioxide in the coal smoke of cities and irritant vapors from the exhaust

of automobiles on city streets probably contribute to the frequency of the respiratory infections in urban districts."

It is obvious from this that the greater concentrations of sulphur dioxide which will be encountered in "servicing an $SO_2$ job" present a real health hazard unless proper precautions are taken by using a mask.

A second group of gases to be considered is that known as Anesthetics.

"The anesthetic gases are characterized primarily by their depressant effect upon the activity of the central nervous system. They are carried to the brain and spiral cord in solution in the blood."

### Methyl Formate

This belongs under the class of "Less Toxic Anesthetics" according to Drs. Haggard and Henderson.

The anesthetic effect is slight.

However, there is an irritating effect, similar to sulphur dioxide altho not so severe, because of the breakdown into formic acid in contact with the moist surfaces of the throat. So again nature's barrier to the entrance of germs is lessened.

### Methyl Chloride

This is grouped as a "more toxic anesthetic" by Drs. Haggard and Henderson.

This group of gases causes organic changes in lungs, heart or intestines.

Methyl Chloride, after absorption, is decomposed, forming methyl alcohol which has a marked accumulative property.

This cumulative property combined with the destructive action of methyl alcohol on the nervous system makes it especially desirable to take precautions against breathing Methyl Chloride in even extremely low concentrations.

### Dichloromethane

This gas also comes under the heading of "non-toxic anesthetic." The normally nontoxic molecule of dichloromethane breaks down at high concentration. In any case, it is desirable to prevent any gas having anesthetic effect from entering the lungs, even though the concentration may be slight.

### F-12 (Dichlorodifluoromethane)

The investigation described in this report was made primarily from the viewpoint of obtaining information relative to the possibility of chronic poisoning resulting from repeated exposure.

The present investigation has shown that at least 20 percent dichlorodifluoromethane vapor can be repeatedly withstood by animals for seven to eight hours daily, with but an occurrence of temporary symptoms and without signs of accumulative or permanent

GAS MASK. COURTESY OF MINE SAFETY APPLIANCES CO.

deleterious effects. These results place the compound in the class of practically nontoxic gases.

In so far as the results of animal experimentation serve as a measure of hazards to persons, the investigation described in this report has shown that the possibility of public health and accident hazards resulting from exposure to dichlorodifluoromethane when used as a refrigerant are remote.

"This report represents work done under a comparative agreement between the U. S. Bureau of Mines and the Frigidaire Corporation. Reprinted from U. S. Bureau of Mines Report of Investigations 3013."

In spite of the above findings it would seem desirable to wear a mask on the theory of having as pure air as possible enter the lungs.

The above has been a discussion of the health hazard of gases encountered in servicing mechanical refrigerators.

There is also the matter of eye protection from the possibility of a "direct hit" from a jet of the refrigerant from the point of the leak.

The recognition of this hazard as well as the health hazard would, therefore, seem to dictate a mask of the full face piece type.

Such a mask should be as much a part of the service man's equipment as a wrench or other tools.

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NOTE:—All quotations are from "Noxious Gases" by Drs. Henderson and Haggard.

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## DETECTING REFRIGERANT LEAKS WITH HULL TORCH

IN detecting leaks in the refrigerator system, it is necessary that the service man know definitely that the method he is employing will satisfactorily detect the minutest leak of the refrigerant. The Hull Leak Detector Torch is especially designed for checking leaks of any Chlorinated Hydrocarbon Refrigerant, including F-12 (Freon), F-114, Dichlorodifluoromethane, Trichlore-ethylene, Methylene Chloride, Methyl Chloride, Ethyl Chloride, Artic and Carrene.

Several patented features are incorporated in the Hull Detector, and it is constructed so that it can be easily taken apart for cleaning or replacement. It has been adopted by large industrial manufacturers of refrigerating and air conditioning equipment as well as railroads. In detecting the smallest leaks that are not easily discernible, the Hull Torch is furnished with a capillary or exploring tee which attaches to the end of the rubber tube.

In a report by a leading chemical manufacturer in their laboratory, the following results were recorded: The maximum sensitivity was 0.15 cc. of F-12 per minute—this being equivalent to 0.06 lb. per month. After exposure to a leak of this type, the flame cleared in three seconds. After a leak of 3½ lbs. per month had been allowed to go into the burner for several seconds, it took only twelve seconds for the flame to clear.

THE HULL LEAK DETECTOR

The maximum suction attainable is better than ½" which is far in excess of the required amount. The Hull Torch Mfg. Co., Hagerstown, Md., is the sole distributor of this detector torch.

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## HOW TO USE THE COMPLAINT CHARTS

AS far as an "all make service engineer" is concerned, there are only five classes of the small electric compression refrigeration systems; the classification being based upon the five methods of feeding liquid thru the restricted orifice.

1. The low pressure float.
2. The high pressure float.
3. The capillary tube or restrictor.
4. The automatic direct expansion valve.
5. The thermostatic direct expansion valve, or thermo-valve.

However, a variety of refrigerants as sulphur dioxide, methyl chloride, Freon (F-12), ethyl chloride, ammonia, etc., may be selected to charge the above five classes thus giving many different types.

## COMPLAINT CHART
## NO. 4

C=CAPILLARY TUBE
LF=LOW SIDE FLOAT
HF=HIGH SIDE FLOAT
DA=AUTOMATIC EXPANSION VALVE

DT=THERMOSTATIC EXPANSION VALVE
T=THERMOSTAT CONTROL
P=PRESSURE CONTROL

| CAUSES OF COMPLAINT | SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|---|
| | LF | | HF | | C | DA | DT |
| | T | P | T | P | T | T | P |
| **COMPLAINT NO. 6—REFUSES TO START AFTER BEING SHUT DOWN SOME TIME** | | | | | | | |
| (a) Loose electrical connection | √ | √ | √ | √ | √ | √ | √ |
| (b) Motor brushes off commutator | √ | √ | √ | √ | √ | √ | √ |
| (c) Burned out armature | √ | √ | √ | √ | √ | √ | √ |
| (d) Blown out overload or fuse | √ | √ | √ | √ | √ | √ | √ |
| (e) Low voltage to motor | √ | √ | √ | √ | √ | √ | √ |
| (f) Stuck up compressor | √ | √ | √ | √ | √ | √ | √ |
| (g) Lost charge in thermostat bulb | √ | | √ | | √ | √ | |
| (h) Manual control switch stuck | √ | √ | √ | √ | √ | √ | √ |
| (i) Loss of charge of refrigerant | | √ | | √ | | | √ |
| **COMPLAINT NO. 7—SUCTION LINE COVERED WITH FROST** | | | | | | | |
| (a) Overcharge of refrigerant | | | √ | √ | √ | | |
| (b) Leaky float valve or valve stuck open | √ | √ | | | | | |
| (c) Wrong float adjustment | √ | √ | | | | | |
| (d) Evaporator not level | √ | √ | | | | | |
| (e) Expansion valve open too far to right | | | | | | √ | √ |
| (f) Controls set too low | √ | √ | √ | √ | √ | √ | √ |
| (g) Slight overcharge of refrigerant | | | | | √ | | |



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*Cut out along outer line and insert in binder for ready reference.*

FOR LEATHER BINDER WRITE TO H. T. McDERMOTT, SECRETARY REFRIGERATION SERVICE ENGINEERS' SOCIETY, 433 N. WALLER AVE., CHICAGO, ILL.

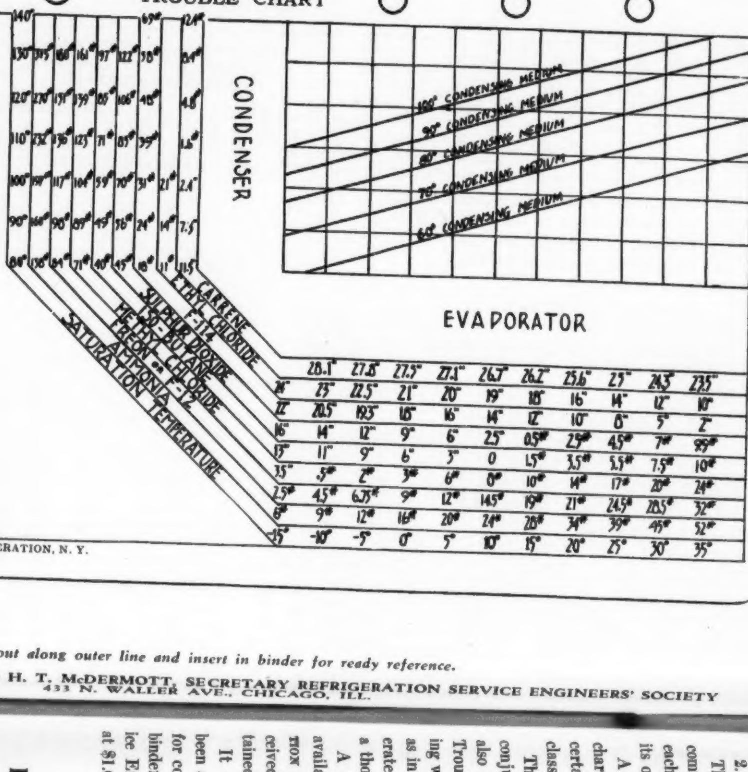
TROUBLE CHART

## HOW TO USE CHART 42H

Suppose the serviceman wants to know the average operating condenser pressure on a sulphur dioxide system, when the operating back pressure is 8" vacuum, and the temperature of the condensing medium (air or water) is 80° F. at the entrance of the condenser.

Find the nearest vacuum to 8" which is 9" in the sulphur dioxide space. Follow the vertical line from 9" to the 80° F. diagonal line. Then follow horizontal from that point to the sulphur dioxide space. The condenser pressure is shown to be between 70 and 85 lbs., or about 77 lbs.

# HERKIMER CONDENSER CHART



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433 N. WALLER AVE., CHICAGO, ILL.

Any system may be listed under two divisions depending upon control:

1. Thermostatic temperature control.
2. Pressurestat control.

There are some troubles and complaints common to all but in the majority of cases, each class, type and division is subject to its own peculiar characteristics.

A close examination of the complaint charts will reveal at the top of every chart certain symbols which designate the five classes and the two divisions.

These Complaint Charts are to be used in conjunction with the Trouble Chart, which also is published in the June issue. The Trouble Chart is a guide for trouble shooting where no specific complaint can be given, as in the event that the machine fails to operate completely and it is necessary to make a thorough test of the entire system.

A limited supply of Trouble Charts are available for subscribers of The Refrigeration Service Engineer, who have not received the June issue. A copy may be obtained by addressing the publishers.

It will be noted that these charts have been arranged so that they may be retained for convenient reference in a flexible pocket binder. Members of the Refrigeration Service Engineers Society may secure a binder at $1.00 by addressing the National office.

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## REFRIGERATOR OILS

THE Matheson Co., East Rutherford, N. J., has recently issued a descriptive folder describing Matheson refrigerator oils.

These refrigerator oils are sold under trade names. Carbolube is of high temperature resistance, low cold fluidity and acid tested, and is especially prepared for use with Methyl and Ethyl Chloride, Isobutane, Carrene and Freon.

Sulfolube is a high grade lubricant for refrigeration work, and will not gum or sludge. It is recommended for use with all gases, but especially for Sulphur Dioxide, Carbon Dioxide and Ammonia.

This new folder contains prices for the different grades of refrigerator oils. The Matheson Co. also handles various refrigerants.

## CONDENSER CHART

THE Condenser Chart which appears on another page of this issue will be found to be very convenient for reference. It is used to explain the estimating of approximate operating condensing pressures with various refrigerants. It enables a service man at a glance to estimate about what the operating condenser should be at the different back pressures and different condensing temperatures. It will be noted that the Chart includes the latest refrigerants, Carrene and F-114. It is a real saturation chart in itself and gives the pressures that correspond to temperatures from -15 degrees to 35 degrees on the low side, and from 80 degrees to 120 degrees on the high side. The only missing degrees are from 35 to 80.

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## FIELD EXPERIENCE

HERE is a field experience contributed by Edward Lampa, secretary of New Jersey Chapter No. 1, R. S. E. S.:

My partner and I became suspicious of continual calls to one of the apartment houses we service. We always found the same complaint, excessive air in the system and no leaks showing under any test.

The superintendent went out to work each day leaving his wife in charge, so we decided to wait and have a talk with him.

He admitted that he undertook to clean the strainers at night by merely shutting off the liquid line and removing the flange when he thought it was empty.

Not realizing what he was in for, he bemoaned the fact that several shirts had been spattered with an oily substance and at times his eyes smarted from the refrigerant. Here it was.

Yes, gentle reader, he no longer cleans the strainers.

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A. W. Snyder
New York

"Enclosed is a money order for my subscription to The Refrigeration Service Engineer. I like the magazine very much. It has served me well already, and I have received only three copies. Lots of success."

# SERVICE POINTERS

**Readers are invited to send descriptions of "kinks" which they have found to be of practical help in their every day work. Just send your idea or sketch in the rough, which will be prepared for publication. All contributors' names will be printed. Address the "Kinks" Editor, REFRIGERATION SERVICE ENGINEER, 433 N. Waller Ave., Chicago.**

## Cleaning Cube Trays

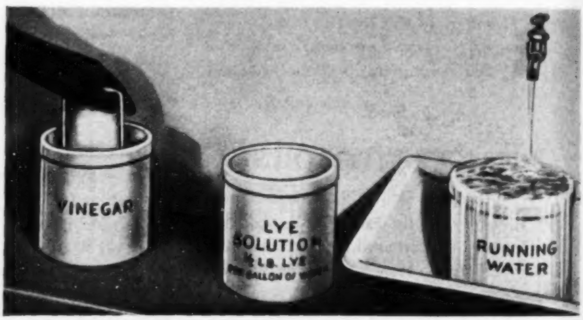
ALUMINUM and tinned copper ice cube trays and grids at times become discolored, through use, particularly in certain localities. When such discoloration does not respond to ordinary methods of cleansing, the following procedure can be effectively used, according to the Electrolux Service Manual:

First, as indicated in the illustration, mix in a three gallon size stone crock, a solution of lye and water, using one-half pound of lye to each gallon of water.

Fill a second crock of the same size with household vinegar.

Place a third crock in a nearby sink, and use this for the running cold water rinse.

Place the trays or grids to be cleansed in the lye solution — the handles may or may not be removed. Let these remain in the solution until the lye has had time to dissolve the discoloration on the surface of the tray or grid. In most instances, this will be about fifteen minutes after the boiling action has been noted around the edges of the part to be cleaned.




METHOD OF CLEANING ICE CUBE TRAYS AND GRIDS

With the aid of rubber gloves or suitable pliers, remove parts from the lye solution and rinse in the running water crock. Then immerse in the crock of vinegar. The vinegar will neutralize the effect of the lye, and will arrest any further chemical action on the part being cleaned.

After an immersion of about ten minutes in the vinegar, rinse the tray or grid again in the crock of running water.

On badly discolored parts, it will be found advantageous to brush them after the lye solution immersion, holding the parts under the running water. It has been found that a stiff tooth brush serves this purpose well, particularly on the grids.

The lye solution is the cleansing agent and the vinegar is simply a neutralizing solution. Trays and grids can be restored to practically their original condition in using this method.

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*TO the Editor*—I note in the August, 1933, number, under the heading of "Service Pointers," an article on "Belt and Fan Rotation."

The writer of this article maintains that fan blades should be bent to force air through and not suck air through condenser. I maintain that the recommendation made in this article is a very broad statement, and I am rather fearful of its results.

For years engineers have conceded that when it is convenient to draw air through an object, the cooling efficiency is increased greatly over the method of blowing air

through, and this will apply generally to the present day air cooled condensing units.

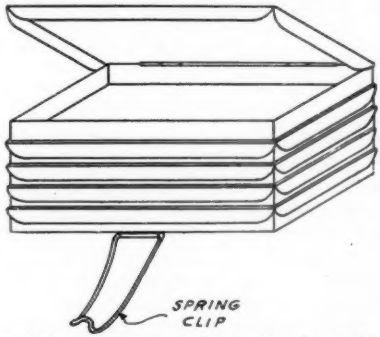
Where air is blown through an object by the conventional fan blade, the movement of air is very definitely confined to a fixed area somewhat inside the outside diameter of the fan. There is little or no air passing from the center or the outer edge of the fan, but more often a counter current of warm air coming back, which is eventually picked up and blown in a warm state through the object to be cooled. It will be observed that when the fan is arranged so that air is blown through, a large portion of the condenser does not come into contact with the air, but in the case of drawing air through the condenser, a very rapid movement of air can be detected or measured over the entire surface of the condenser, with the exception of the extreme corners.

Another bad feature in blowing air through present day condensers is that the heat from the motor is picked up and deposited in the condenser. Air that is drawn through the condenser and blown over the motor will have a tendency to prevent the motor from over-heating. Inasmuch as it is impossible to blow air directly through all makes of motors, the current of air from the fan passes over the motor housing and does a very satisfactory job of cooling. Also, air that is drawn through a condenser comes in contact with its work before it reaches the fan, which, due to heat energy and friction, will warm it several degrees. Undoubtedly service men will note that in their work the most successful air cooled units pull and do not push air through the condenser. It will be well to bear in mind that the refrigerating units of today, with the exception of a few, have been thoroughly tested by experienced engineers during their development, who have every conceivable measuring instrument and device at their command to determine performance data.

The writer would recommend to never change a pull condenser to a push condenser. Very often improvement of operation can be obtained where the motor has a tendency of running hot, by changing fans from push to pull. Of course, this means changing the fan to a design whose blades are of an opposite pitch.—*T. J. Fowler.*

## Handy Way of Keeping Small Parts

**WALTER T. GUY, service man for the Evergreen-Kelvinator Sales, Kelvinator Dealer at Evergreen Park, Illinois, has a handy way of keeping such small parts as**




**gaskets, compressor valves, etc. A number of flat cigarette tins were soldered together by soldering the top of one to the bottom of the one above and then putting a spring clip on the front. This makes a very simple container and keeps parts clean and in good condition.**

* * *

Brunner Mfg. Co.,
New York.

"I want to commend you on the splendid job you have done with the first issue. I think you have made a splendid showing."
—M. H. Pendergast.

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C. L. Hooker
Florida.

"Enclosed you will find my $2.00 for subscription to The Refrigeration Service Engineer. This money will pay for more education than any money I have ever spent, if we can judge the future numbers by the July number, and we have the assurance of the editor that all of the articles in future numbers will be just as educational. The Question Box is going to be a great help to service men like myself, way off in the edge of the woods."

---

F. Henry,
Oklahoma.

"Find enclosed postal money order for $2.00 for one year's subscription to The Refrigeration Service Engineer, starting with the August issue. Judging from the two issues I have already received, I believe the magazine is going to be a fine one."

# The Control of Refrigerants . . .

**ARTICLE NO. 2**

**HAND CONTROL EXPANSION VALVES**

**In This Article a Few Fundamental Principles of Mechanical Refrigeration Are Discussed. The Function of the Hand Expansion Valve and Its Shortcomings.**

*By* **J. L. SHRODE, President, Alco Valve Co.**

IN order to appreciate fully the operation and advantages of the various automatic control devices to be discussed in subsequent articles it is well to review briefly a few fundamental principles of mechanical refrigeration. The function of the hand expansion valve and its shortcomings are also discussed in the following article.

In a refrigerating system some means of controlling the flow of the refrigerant must be provided. It is necessary to reduce the refrigerant from the condensing pressure to the evaporating pressure and at the same time regulate the quantity of refrigerant flowing into the evaporator. The simplest form of such a control means is the hand expansion valve. This valve may correctly be termed a pressure reducing valve. Starting at the receiver where the liquor is stored at a high pressure, it passes through the hand expansion valve into the evaporating coils, where the pressure is greatly reduced. The amount of liquid passing through the valve depends upon the set size of the orifice and upon the difference in pressure between the high and low sides of the system.

Some of the refrigerant flashes into a gas just as it passes the valve. This is known as "flash gas" and has no refrigerating value except that it cools the remaining liquid at the valve to the evaporator temperature. If ammonia is used, approximately 15% of it flashes into a gas at the expansion valve. This percentage at specific pressures may be readily calculated or obtained from the Bureau of Standards, Mollier Chart of the Properties of Ammonia. The rest of the liquid passes from the expansion valve into the coils at reduced pressure. The exact low side pressure, known as the suction pressure, depends upon the rate of admission of liquor into the evaporator by the expansion valve and upon the rate at which the compressor pumps the gas out of the evaporator. The load and temperature conditions also have an effect upon the suction pressure.

Assuming a constant load in the room and a constant suction pressure at the expansion valve, if the expansion valve is opened wider, more liquid will be admitted to the coil, vaporization will increase and the suction pressure will rise. Conversely, if the valve is closed slightly, less liquid will enter the evaporator, vaporization will decrease, the compressor will pump the gas faster than the liquid vaporizes, and the suction pressure will drop.

In practice, the hand expansion valve is set at what seems to be the proper opening but varying conditions made it impossible for this setting to be always correct. Suppose the hand expansion valve were on a system which merely has to bring a constant load down to temperature and then maintain that temperature. The expansion valve is set to admit enough refrigerant to cool the load in a reasonable length of time. As the load cools down, the temperature difference between the expanding gas and the outside surroundings is reduced to a point where the heat transfer is too small for the amount of ammonia being fed into the evaporator. Unevaporated liquid then starts going back to the compressor and the condition known as "frosting back" then exists. Even though the system were a "semi-automatic" one, that is, one in which the compressor would be shut down by a thermostat when the load was down to temperature, the hand expansion valve would be inadequate. When

the machine shuts down, the hand expansion valve, of course, remains open and liquid will continue to flow into the evaporating coils. When the machine starts up, it must first pump out enough liquid to cool the remaining liquid below the load temperature before useful work is done in the evaporator.

Now assume that the hand expansion valve is on a system handling loads that vary a good deal. This is more apt to be the case than the one discussed above. The expansion valve is set to take care of a certain load and then that load, let us say, is suddenly increased. The expansion valve is then not open wide enough and is not feeding enough refrigerant. All of the liquid is evaporated in the first part of the evaporating coil and the last part of the coil will be getting a dry gas instead of liquid and will be doing no work.

The hand expansion valve is inadequate because varying load conditions, such as the opening and closing of doors or the removal or addition of stored goods, and also the variation in outside and cooling water temperatures, call for different degrees of valve opening. This cannot be accurately regulated by hand. The application for the hand expansion valve is on small installations where the expense of automatic equipment is prohibitive and also on extremely large systems, such as ice and refrigerating plants, where the loads are nearly constant and where an operator is always in attendance. The advantages of automatic control equipment which will take care of the varying conditions always present in a refrigerating system can readily be appreciated.

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T. W. Carraway
Texas

"I am convinced, after reading your publication, that it will prove most helpful to the refrigeration service men, and I am recommending to Mr. Harry Gertiser to subscribe to the magazine, which subscription you will receive in a few days."

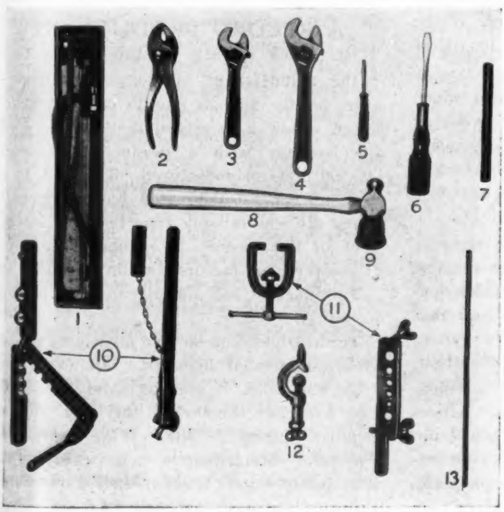
✕ ✕ ✕

## INSTALLATION TOOLS

IT is important that the service engineer have at hand the necessary tools for the servicing the various types of electric refrigerators, and such tools can be obtained at very reasonable prices.

The June issue of this magazine contained an illustrated description and particulars on servicing the new Air Cooled Electrolux Refrigerator. The only special tools required for this equipment are those used to work flexible metal tubing. The following are recommended by the Electrolux Company:

Tubing cutter, bending tool, flaring block and punch. If desired, the last two may be obtained in a combination bending and flaring tool. The remainder of the tools needed for installation or service can be readily purchased from any refrigeration supply store.

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**SERVICE TOOLS**

1. Orifice meter
2. Pliers
3-4. Crescent wrenches
5. Orifice adjusting screw driver
6. Screw driver
7. Outside bending spring
8. Ball-pein hammer
9. Rubber crutch grip
10. Combination bending and flaring tool
11. Flaring block and punch
12. Tubing cutter
13. Inside bending spring

*The* REFRIGERATION SERVICE ENGINEER

A Monthly Illustrated Journal, Devoted to the Interests of the Engineer Servicing Refrigeration Units, Oil Burners and other Household Equipment.

Vol. 1 September, 1933 No. 4

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*Official Organ*
REFRIGERATION SERVICE ENGINEERS' SOCIETY

## COMMERCIAL SERVICING

THE servicing of small commercial refrigerating equipment is a profitable business for the service organization and service man to develop. The refrigeration requirements for commercial equipment are possibly more exacting than the household refrigerator business, and the necessity for reliable and consistent operation to prevent expensive losses which might occur if the system is out of service for any length of time is obvious.

Then, too, the continuous service which commercial equipment is subjected to during the hot weather months makes it imperative that the system should be thoroughly checked and prepared for operation for the next season.

This servicing is most advantageously done during the Fall and Winter months, and the service engineer should make definite plans to solicit this business and thus offset some loss of the household refrigerator business during the winter months.

It is at this time that the user of commercial equipment usually plans any changes that would be desirable such as new counters, re-arrangements, providing more refrigeration for display and storage purposes, etc.

## COMMENDABLE START

PRICE cutting is not generally done with the intention of losing money, but more often the result of a lack of knowledge of actual costs which good business management dictates should enter into every transaction.

The man who knowingly takes business at a loss, whether on material or labor, is certainly due for a sad awakening at an early date.

The business of refrigeration servicing is not alone in that it experiences such practices in its work. Unquestionably, this condition is the result of organizations or individuals not having definite knowledge of what costs enter into their business.

The Refrigeration Service Engineers' Society, through some of its local Chapters, is making inquiry among its membership in order that some definite basis can be arrived at, and to serve as a guide for all as to what costs actually consist of. It is hoped through this educational activity that the business of refrigeration servicing may be more enlightened so that the service business may be assured of a fair return for its services.

We say that this is a commendable start, and is certainly in line with the spirit of the N. R. A.

## A RECORD PRODUCTION

FIGURES recently published show that the manufacture of domestic refrigerators for the first six months of 1933 established a new high record in the history of the industry with a production of over 690,000 units manufactured. This, too, in a year of general depressed business conditions. It was reliably reported that in the peak of this business, a number of the refrigerator manufacturers while operating at full production, had difficulty in filling orders promptly.

The refrigeration service man is no doubt vitally interested in sales. For every refrigerator sold, it can be safely assumed that a certain amount of servicing will be required during its life. With production and sales establishing a new peak record, it certainly augurs well for the future of the refrigeration servicing business.

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# THE Question BOX

**Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box" which will be answered by competent authorities.**

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*Question 6.* (1) Why are there several different kinds of refrigerants used by small unit manufacturers? (2) I would think that sulphur dioxide and ammonia should be the only refrigerants used. (3) Could different refrigerants be used by changing the speed of the compressor, and if so what other changes should be made?

Answer. (1) The designers of small units select refrigerants for their reliability and adaptability for their particular application to their machine. $SO_2$, Methyl Chloride, Isobutane and several other refrigerants can be used in machines where copper, brass and bronze are employed. Their pressures are relatively low, and for this reason the machine can be constructed smaller and lighter, and consequently cheaper. These gases can also be condensed in air cooled machines. Ammonia has not been found to be adaptable to the ordinary air cooled type of condenser, and should never be used where copper, brass or bronze are present. (2) Ammonia has been used by only a few manufacturers of household machines. (3) Isobutane can be replaced with $SO_2$ without major changes to the unit. However, in making this change, the system must be thoroughly cleaned and dehydrated. Methyl Chloride can be replaced with $SO_2$ which of course will reduce the capacity of the compressor about thirty per cent, which can be overcome by speeding up the compressor. Again we repeat, the system must be thoroughly cleaned and dehydrated. Changing from $SO_2$ to methyl chloride is not advisable, as a larger motor will be required, and in most cases, a change of seal spring tension will be necessary, and this change is rather technical.

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The following questions were placed in the Question Box of Chicago Chapter, and answered by Mr. C. E. Hamilton, chairman of the Educational Committee:

*Question 7.* What is the safe working pressure of a shell receiver 18" in diameter, 5' long and constructed of 1/4" steel, with all joints welded?

Answer. A receiver of this size has a bursting strength of 1388 pounds per square inch, provided the welds are made as strong as the pipe, or stronger. Using a safety factor of 5, which is commonly used, a working pressure of 276 pounds per square inch should be safe for this type of apparatus, provided it is new and the welds are well constructed. It is also common practice to use a safety factor of 5 to determine the safe working pressure for copper tubing. For example, bursting strength of 20 gage, 1/2" O. D. copper tubing is 4850 pounds per square inch, the safe working pressure 970 pounds per square inch.

*Question 8.* What is the refrigerant used in the Crosley Icy-Ball and what is the quantity of the charge?

Answer. The Crosley Icy-Ball is of the absorption type system and uses ammonia ($NH^3$) as the refrigerant. As far as I know, the Crosley Corporation have never released information as to the quantity of the charge. However, the design of this unit does not lend itself to recharging in the field.

*Question 9.* What is the pump of the absorption system of refrigeration?

Answer. It is an ammonia pump located below the level of the absorber and serves to pump the aqua ammonia solution from the absorber to the generator. It may be of either single or double acting reciprocating piston type construction. Such pumps are used on large absorption systems. Domestic absorption systems are so arranged to eliminate this pump, thereby eliminating the only moving piece of machinery used in absorption systems.

# REFRIGERATION SERVICE ENGINEERS' SOCIETY

**Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.**

**THE OBJECTS OF THE SOCIETY**

To further the education and elevation of its members in the art and science of refrigeration engineering; with special reference to servicing and installation of domestic and small commercial equipment; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

**ASSOCIATION HEADQUARTERS: 433-435 North Waller Ave., CHICAGO, ILL.**

## MEETINGS OF CHAPTERS

### Detroit Chapter No. 1

**Meeting of August 2**

THE second meeting of Detroit Chapter No. 1 was held at the Detroit City College, Cass and Warren Ave., with about fifty in attendance.

The meeting was called to order at 8:30 by Temporary President L. R. Richards, who announced that the first order of business would be the reading of the minutes of the last meeting. This was done by Temporary Secretary Rothenberg, and on motion were approved as read.

The President then called upon Mr. Nickerson, of Chicago, for a statement in reference to the purposes and objects of the Refrigeration Service Engineers' Society for the benefit of those present who had not attended the previous meeting. Mr. Nickerson spoke briefly, following which, the application blanks for membership were distributed to be signed and handed in before the close of the meeting.

Secretary Rothenberg said that as permanent officers were to be elected at this meeting, he thought that it would be in order to present the matter for action and stated that he would be very glad to turn his office over to the permanent secretary who might be elected. President Richards and Treasurer Klein made similar remarks. On motion of Mr. Oberc, a vote of thanks was extended to the temporary officers for their labors in carrying on the temporary work and arranging for the present meeting.

At this point the applications were collected and dues received, either in full or in part, for the calendar year. After some discussion it was decided that every one having made application for membership would be considered a member and eligible to vote for permanent officers.

On motion, it was decided that the nominations for officers be made from the floor and elected by ballot. On motion the President was authorized to name a committee of three tellers of election. President Richards appointed Messrs. Palmer, Clark and Murphree as tellers of election.

The following were nominated for the office of President: James Nolan, Geo. Murphree and Geo. Clark. The results of the ballot showed a tie vote between Murphree and Clark, necessitating another ballot which was decided in favor of George Clark for the President, and Temporary President Richards turned over the meeting to the newly elected President.

The next officer voted on was Secretary, with the following nominations: L. R. Richards, Max Rothenberg, George Murphree, Sydney Fletcher, and A. P. Stevens. Both Mr. Richards and Mr. Rothenberg declined the nomination, expressing the opinion that they had served only as temporary officers and that others should be selected as permanent officers. The ballot taken on the re-

maining three nominees resulted in the election of George Murphree as Secretary.

The following nominations for Treasurer were made: R. S. Palmer, A. P. Stevens and James Nolan. A ballot on this office resulted in the election of Mr. Stevens as Treasurer.

Mr. Richards then made a motion that Mr. O. Evans be nominated Sergeant-at-Arms, and this motion was carried and Mr. Evans was duly elected Sergeant-at-Arms.

On motion the election of other officers was left open until the next meeting.

The time for holding the meetings was fixed for the first and third Wednesday of each month, confirming action taken at the previous meeting.

On motion, the place for holding the next meeting was left with the President and Secretary to arrange for, and in the absence of the election of a Chairman of the Educational and Examining Board, President Clark was authorized to arrange for a program for the next meeting.

On account of the lateness of the hour, the meeting then adjourned.

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## Greater Chicago Chapter No. 1

### Meeting of August 8

THE meeting was called to order by President T. J. Fowler, and after disposing of the usual business, Mr. Frank R. Markley, of the Sun Oil Co., Philadelphia, Pa., delivered an interesting talk on "Lubricating Oils for Domestic Refrigeration," and illustrated part of his talk with lantern slides, describing the refining process of Sun oils.

Mr. Markley's talk was followed by Mr. George Knoll, of the Mine Safety Appliance Co., who described a small, convenient mask, particularly adaptable for the use of service men.

After the educational program, President Fowler called upon Mr. Henry Seidenbecher, chairman of the Standards Committee, for their report. The report was read, and a lively discussion took place. It was finally decided that, as each member would have a copy of this report in the official organ before the next meeting, further definite action should be postponed until that time.

The following additional members were appointed on the Standards Committee: Paul Jacobsen, Peter Stein and George Monjian.

Communications were read from the Howe Ice Machine Co., Chemical Distributors, and Chicago Section, Refrigerating Machinery Association, relative to the suggested prices contained in the report of the Standards Committee.

**Special Meeting of Standards Committee**

A meeting of the Standards Committee was held to consider further the matter of the report submitted to Chicago Chapter, and at this meeting it was decided that each member could be of assistance to the Standards Committee by supplying definite information, which can be compiled and used for the guidance of the Committee in its future reports. Therefore, the following questionnaire was sent to each member, with the request that it be filled in as completely as possible, and returned, unsigned, to the secretary, with any additional remarks that each member may desire to make:



QUESTIONNAIRE—COMMITTEE ON STANDARDS

Possibly the greatest need at this time is definite knowledge of costs, if we are to receive fair prices for our services. To assist your committee in making recommendations for your consideration, please fill in this questionnaire as fully as possible, and place it, unsigned, in a box which will be placed on the secretary's table at the next stated meeting. If unable to attend, please mail it to Chicago Chapter, Refrigeration Service Engineers' Society, 433 North Waller Ave., Chicago.

COST OF TRANSPORTATION

Depreciation of car ....%
Cost per hour $........
Cost per call $........
Cost per mile $........
Do you figure insurance, license, etc.?
Yes.... No....
Do you maintain a truck? Yes.... No....

COST OF OVERHEAD

Light and Heating Power
Rent
Telephone
Office Help
Stationery and Supply
Printing and Advertising
Postage
Cartage
Cost of Estimating Jobs
Repeat Calls
Loss of Tools
Taxes and Insurance
Unpaid Bills
What do you consider a fair profit on parts?
What do you consider a fair profit on labor?
What do you consider a fair price per hour?
Remarks:

**Meeting of August 22**

After disposing of the usual business of the meeting, President T. J. Fowler turned the meeting over to Mr. C. E. Hamilton, chairman of the Educational Committee, who introduced Mr. C. A. Olson, of the Bush Manufacturing Co., Hartford, Conn., who talked on "Fin Coils."

President Fowler then announced the appointment of Messrs. A. E. Karlberg, F. J. Plonsker, Ray Smith, Clarence Freestone

and Ivar Skipple to the Membership Committee. These are additions to the present Committee, consisting of Messrs. H. J. DeGan and Ralph B. Vanston.

The President also announced Mr. George Monjian as chairman of the Entertainment Committee.

The reports of the Membership Committee and the Educational Committee were given. The Standards Committee submitted a further report, and requested each member to return promptly the questionnaire which has been mailed to him, in order to further promote the work of this Committee.

It was also suggested that at the meeting of September 12, actual demonstrations be given on a blackboard, showing the method of procedure in estimating the various classifications of refrigeration work.

WEPSCO BEVERAGE COOLER

x x x

## BEVERAGE COOLER

A NOVEL arrangement of a beverage cooler for offices, apartments, dens and summer homes is manufactured by the Wepsco Steel Products Co., Blue Island, Ill.

Kool-A-Desk is the name of this new, mechanically refrigerated cooler, and every particle of space is utilized in the arrangement of this novel dispenser. The unit has all the appearance and dignity of a fine piece of furniture, and upon opening, provides a serving bar, 12x30 inches, with a refrigerated space capacity to provide for four cases of beer, cold steins, ice cubes, etc.

---

Harley R. Ferguson
Michigan

"Enclosed please find $2.00 in currency for subscription to The Refrigeration Service Engineer. This is what the field service men have been in need of for some time."